Adaptive landscapes: Top-down and bottom-up perspectives

BENJAMIN KERR, University of Washington

Sewall Wright introduced the metaphor of the adaptive landscape, a map from genotype to fitness, more than 80 years ago to help describe his view of adaptive evolution. This metaphor has been immensely popular and has been used in a variety of incarnations. However, a systematic study of the genotype-fitness map presents significant problems. The space of possible genotypes is vast, and the mapping is likely dependent on both environment and the composition of genotypes in a population. In this talk, I will discuss some of these problems and present experimental strategies for uncovering features of adaptive landscapes. In particular, I will discuss how population structure can be used as an experimental variable to elucidate landscape topography and how a combination of experimental evolution and genetic engineering can reveal important landscape features in changing environments. I will also present some potential applications of this work to the problem of antibiotic resistance and potential implications for evolutionary rescue in the face of global climate change. For some of these topics, the classic notion of the adaptive landscape must itself be adapted; however, I propose that there are fruitful ways to continue to apply this metaphor.